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This report summarizes progress made under the grant during this period, and lists titles of papers resulting from the research.

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MULTIVARIABLE PROBLEMS OF STATISTICS AND INFORMATION THEORY

FINAL REPORT, GRANT AFOSR-82-0156
For the Period 15 APR 82 - 14 APR 83

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10 JUNE 1983

MULTIVARIABLE PROBLEMS OF STATISTICS AND INFORMATION THEORY, Final Report, Grant AFOSR-82-0156, 15 April 1982 - 14 April 1983.

During the year 1982-83, a great deal of work, both in quantity and quality, in volume as well as in depth, was accomplished. Three papers were written and two more were revised. Besides these five papers, there is one half-written paper which was presented at the Nashville meetings of the Institute of Mathematical Statistics in March, 1983. Its title is, "On the probability of correct search for search designs of resolution $2f+1$," plus one I." The two papers, recently revised on the lines suggested by the referees, are entitled, "On a decision rule using dichotomies for identifying the nonnegligible parameter in certain linear models," joint with Mallenby, and "Theory of symmetrical factorial designs of the parallel flats type I. The coefficient matrix," joint with Anderson and Mardekian, respectively. Each of these two papers is about 30-40 typed pages long. The first of these concerns a unique decision rule for identifying a single nonnegligible parameter, which achieves the lower information-theoretic bound on the number of observations. The second one consitutes a very major development in the theory of experimental design, and connects this field with the theory of cyclotomic fields, and Galois Theory. A paper with Shirakura entitled, "Characteristic polynomial of second-order 3^n factorials approached through 2^n factorials," has been submitted for publication. A joint paper with Beaver entitled, "Recovery of information from nuisance factors in nested multidimensional block designs," is about ready to be submitted. The paper with Shirakura involves formidable algebraic computations. The one with Beaver points out some important properties of the nested multidimensional block designs, which were introduced by the author in an invited paper presented at the meetings of the International Statistical Institute in Argentina, 1981. Finally, a paper entitled, "Sensitivity and revealing power: two fundamental statistical criteria other than optimality arising in discrete experimentation," which is 27 typed pages long, has been accepted for publication in a volume being edited by Dr. Klaus Hinkelmann in honor of Professor Kempthorne. In this paper, two new criteria for statistical designs have been established. This paper makes a very fundamental conceptual advance.

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